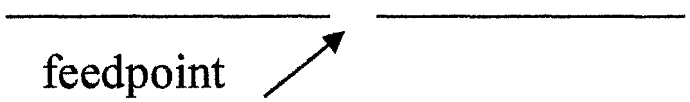
DAMAX INTERNATIONAL

ANTENNA TECHNOLOGY

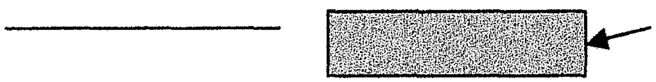
TABLE OF CONTENTS

CURRENT CELLPHONE ANTENNA TECHNOLOGY

A basic dipole



Form of dipole on a cellphone

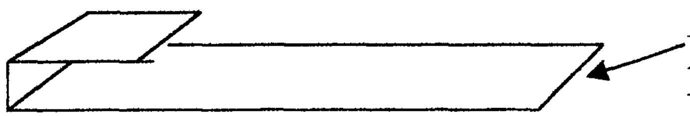


Half of dipole replaced by ground traces on printed wiring board

Reducing the dipole length

Coiled qtr. wave

The planar inverted-F(usually internal)



Printed wiring board with bent qtr. Wave at top end

PROBLEMS WITH CURRENT CELLPHONE ANTENNAS

Current cellphone antennas have omnidirectional antenna patterns in free space (except the planar inverted-F, which if made large enough, can generate a small front to back rejection).

This results in approximately 50% of the transmit RF energy directed toward the user's head when the cellphone is brought up to the normal talk position. This RF energy has two effects; a) the RF field from digital cellphones causes loud audio noise in hearing aids b) Specific absorption rate (SAR) may be difficult to maintain at or below the mandated level of 1.6 mw/g without decreasing power output from the cellphone (which reduces communication range)

Other problems include a) Absorption of 2-3 dB of transmit/receive RF energy by the hand, which is holding the "bottom half" of the "antenna" and b) reduced antenna efficiency or "gain" due to foreshortened radiating element

THE DAMAX ANTENNA

The DAMAX EXTERNAL ANTENNA ASSEMBY

[ANTENNA DIAGRAM OMITTED PURSUANT TO SECTION 0.459 OF THE FCC'S RULES, 47 CFR SEC. 0.459.]

NOTE:

The antenna is currently being tooled as an aftermarket product, for installation on current cellphones which have an external antenna port. This will allow immediate access to the technology for cellphones already manufactured.

In future, the antenna system should be integrated into cellphones by manufacturers, which would result in more efficient industrial design.

BENEFITS OF THE DAMAX ANTENNA

The DAMAX antenna exhibits a unique antenna pattern, in that rejection of 10 dB average (30 dB peak) over substantial angles off the front (keyboard) side of the cellphone, and high average gain (+3 dBi peak gain typical) over large portions of the hemisphere away from the head, are achieved.

The design of the DAMAX antenna also vastly reduces RF on the PWB of the cellphone, which means energy loss to the hand is minimal.

Benefits of the technology above include a) Elimination (or substantial reduction) of audio noise in hearing aids from digital cellphones b) A great reduction of SAR, and c) Longer battery life due to lower commanded power and fewer dropped calls, both of which result from much higher antenna efficiency.

TEST DATA CONFIRMING PERFORMANCE OF DAMAX ANTENNAS

ANTENNA PATTERNS

Representative free space antenna patterns for both the US PCS Band and US Dual-Band antennas are shown in Appendix A. These were measured in an anechoic chamber at the facilities of Signal Antenna Systems Inc in Watsonville, CA, a strategic partner of DAMAX International. Reference dipoles provide the gain calibration for these patterns, and the antennas were tested attached to the rear of appropriate cellphones.

The substantial front to back rejection, high forward gain, and large cellsite illumination angles are evident from these patterns.

HEARING AID NOISE REDUCTION

Comparative tests of a DAMAX dual-band antenna vs the cellphone's standard antenna were conducted by Starkey Laboratories in Eden Prarie MN on April 8, 2002, using a Nokia 5165 digital cellphone and two Starkey hearing aids. Results shown on the plots in Appendix B indicate that noise from the digital protocol of the cellphone , which reached SPL (sound pressure level) values of 70-85 dB when the cellphone's standard antenna was used, were virtually eliminated when the DAMAX antenna was installed on the cellphone, replacing it's standard antenna.

The test setup consisted of a Nokia 5165 (TDMA dual-band, tri-mode) cellphone placed on a normal call to a nearby desk telephone. The hearing aid under test was then placed approximately ½ inch away from the speaker of the cellphone, and it's audio output (which would normally go into the wearer's ear) fed into a spectrum analyzer. The audio output from the hearing aid was then measured for the cellphone using it's standard antenna, and then using the DAMAX dual-band antenna.

Starkey engineers estimate that out of the more than 12 million hearing aid users in the US and EU that could benefit from DAMAX technology, approximately 70% (US) and 50% (EU) wear in-the-ear (ITE) aids such as those used in these tests, and 30% (US) and 50% (EU) wear behind-the-ear BTE) aids. Starkey engineers also estimate that approximately 3% of the total US and EU aids are the highest power BTE 's for people with severe hearing loss, for which DAMAX technology would provide limited benefits.

SPECIFIC ABSORPTION RATE (SAR)

SAR testing of two DAMAX antennas were conducted by Intertek Testing Services of Menlo Park, CA on April 5, 2002. The antennas were a) A DAMAX PCS Band unit installed on the rear of a Kyocera 2255 (Sprint PCS cellphone) and b) a DAMAX dual-band unit installed on the rear of a Nokia 5165 (TDMA dual band) cellphone.

The antennas were fed with 0.5 watts CW, at transmit-band frequencies of 1880 and 835 MHz. Measured SAR levels were said to be among the lowest, if not *the* lowest, seen by this ITS lab, for the applied power level of 500 mw. Data is summarized in the table below, with detailed plots shown in Appendix C.

DAMAX PCS ANT:	SAR (1g.)*		SAR (10g.)*	
(On Kyocera 2255)	Tilt	Cheek	Tilt	Cheek
(1880 MHz)	0.25	0.23	0.14	0.14
DAMAX Dual-Band ANT:				
()n Nokia 5165)				
(1880 MHz)	0.09	0.12	0.07	0.07
(835 MHz)	0.12	0.18	0.07	0.13

* Normalized to 0.25 watts average power

APPENDIX A

ANTENNA PATTERNS

Damax PCS Antenna
Installed on Kyocera 2255

SIGNAL ANTENNA SYSTEMS INC

For use with CDi turn table and Panther LI controller

TEST PARAMETERS

Tx POLARIZATION
Horizontal

ROTATION
Elevation 1

ANTENNA DESCRIPTION

DATA: GAIN/ABSOLUTE
Gain

A/G

FREQUENCY BAND
US PCS horiz-

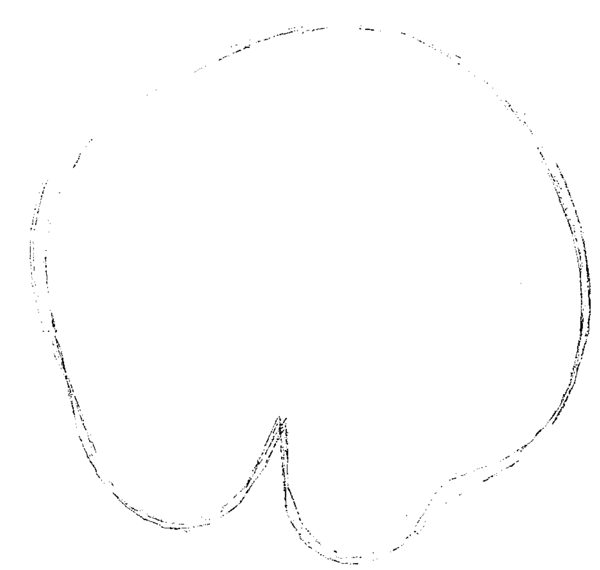
FILE NAME
First ITS PCS

Test Parameter Setup

Calibrate Dipole

Recall Data

START TEST



Degrees per Data Point
5

CARTESIAN | POLAR
Pattern Presentation

Scale Minimum
-35 dB

Scale Maximum
5 dB

Rescale

Chamber
SAS1

DATE
4/5/2002

TIME
4:01 PM

BEAM PEAK

Freq(MHz)	Degree	dB(Abs)	dBi(Gain)
1850.0	25.000	-35.08	3.6175
1870.0	25.000	-35.11	3.5492
1890.0	25.000	-35.22	3.1957
1910.0	25.000	-35.56	3.1781
1930.0	25.000	-35.52	3.1937
1950.0	20.000	-36.01	3.3011
1970.0	20.000	-36.03	3.2835
1990.0	20.000	-36.28	3.1865

Damax Dual-Band Antenna
Installed on Nokia 5165

SIGNAL ANTENNA SYSTEMS INC

For use with CDI turn table and Panther LI controller

TEST PARAMETERS

Tx POLARIZATION
Horizontal

ROTATION
Elevation 1

ANTENNA DESCRIPTION

DATA: GAIN/ABSOLUTE
Gain A/G

FREQUENCY BAND
US PCS horiz-

FILE NAME
First ITS DB

Test Parameter Setup

Calibrate Dipole

Recall Data

START TEST

Degrees per Data Point: 5

CARTESIAN | POLAR

Pattern Presentation

Scale Minimum: -35 dB

Scale Maximum: 5 dB

Rescale

Chamber
SAS1

DATE
4/5/2002

TIME
3:56 PM

BEAM PEAK

Freq(MHz)	Degree	dB(Abs)	dBi(Gain)
1850.0	305.00	-35.88	2.8207
1870.0	310.00	-35.82	2.8441
1890.0	305.00	-36.15	2.2699
1910.0	305.00	[illegible]	[illegible]
1930.0	305.00	-36.55	2.1585
[illegible]	[illegible]	[illegible]	[illegible]
1970.0	305.00	-36.63	2.7856
1990.0	305.00	-35.93	3.5342

Damax Dual-Band Antenna
Installed on Nokia 5165

SIGNAL ANTENNA SYSTEMS INC

For use with CDI turn table and Panther LI controller

TEST PARAMETERS

Tx POLARIZATION
Horizontal

ROTATION
Elevation 1

ANTENNA DESCRIPTION

DATA: GAIN/ABSOLUTE
Gain
A/G

FREQUENCY BAND
US Cell horiz-

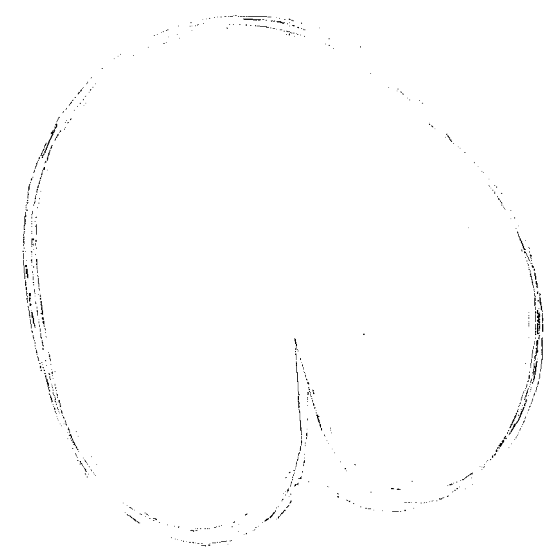
FILE NAME

Test Parameter Setup

Calibrate Dipole

Recall Data

START TEST



Degrees per Data Point
5

CARTESIAN | POLAR
Pattern Presentation

Scale Minimum
-35 dB

Scale Maximum
5 dB

Rescale

Chamber
SAS1

DATE
4/5/2002

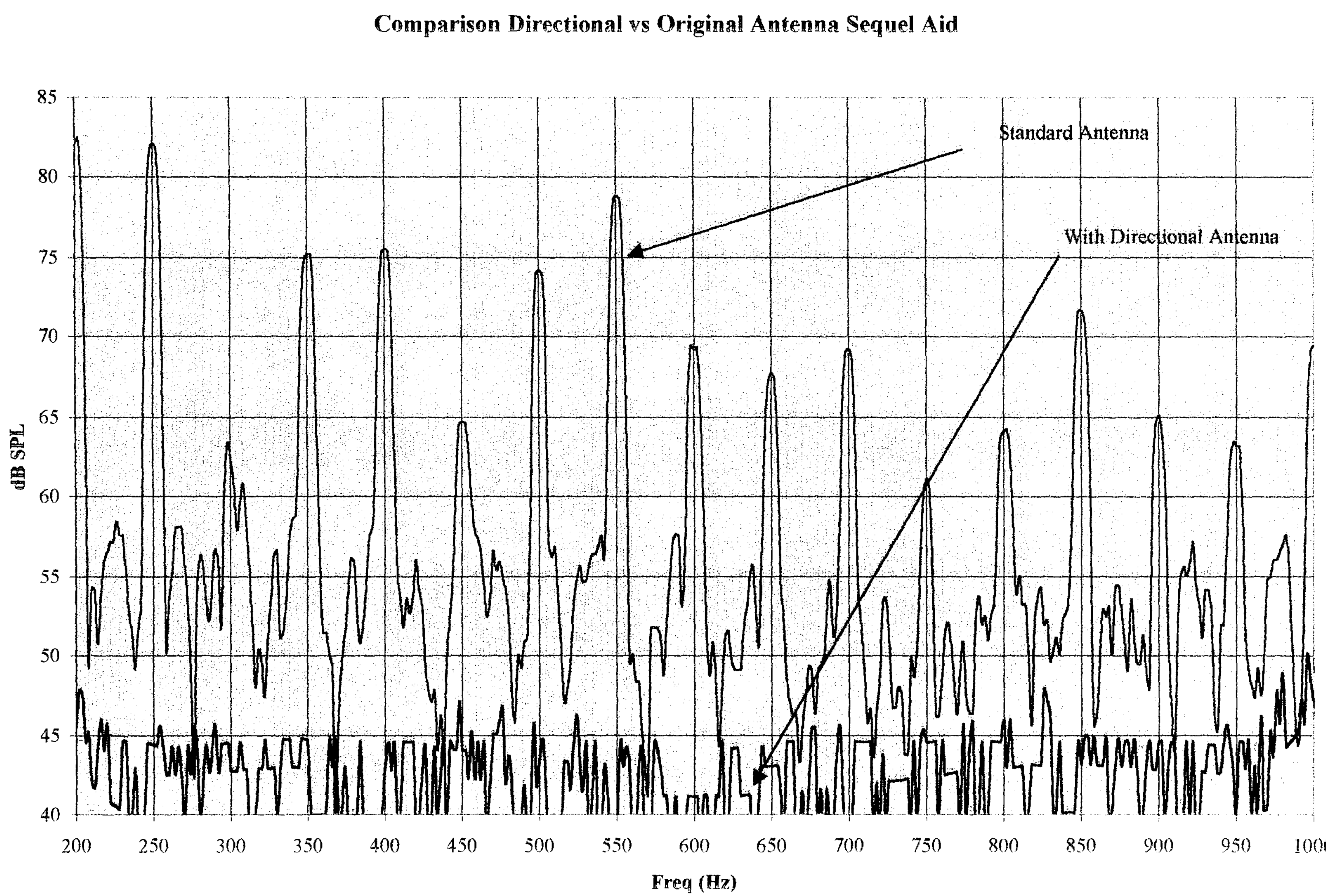
TIME
4:41 PM

BEAM PEAK

Freq(MHz)	Degree	dB(Abs)	dBi(Gain)
824.00	330.00	-27.68	2.1576
834.00	330.00	-27.70	1.8285
844.00	330.00	-28.38	0.8226
854.00	330.00	[illegible]	[illegible]
864.00	330.00	-27.23	1.7738
[illegible]	[illegible]	[illegible]	[illegible]
884.00	330.00	-27.86	1.2914
894.00	330.00	-28.41	0.7435

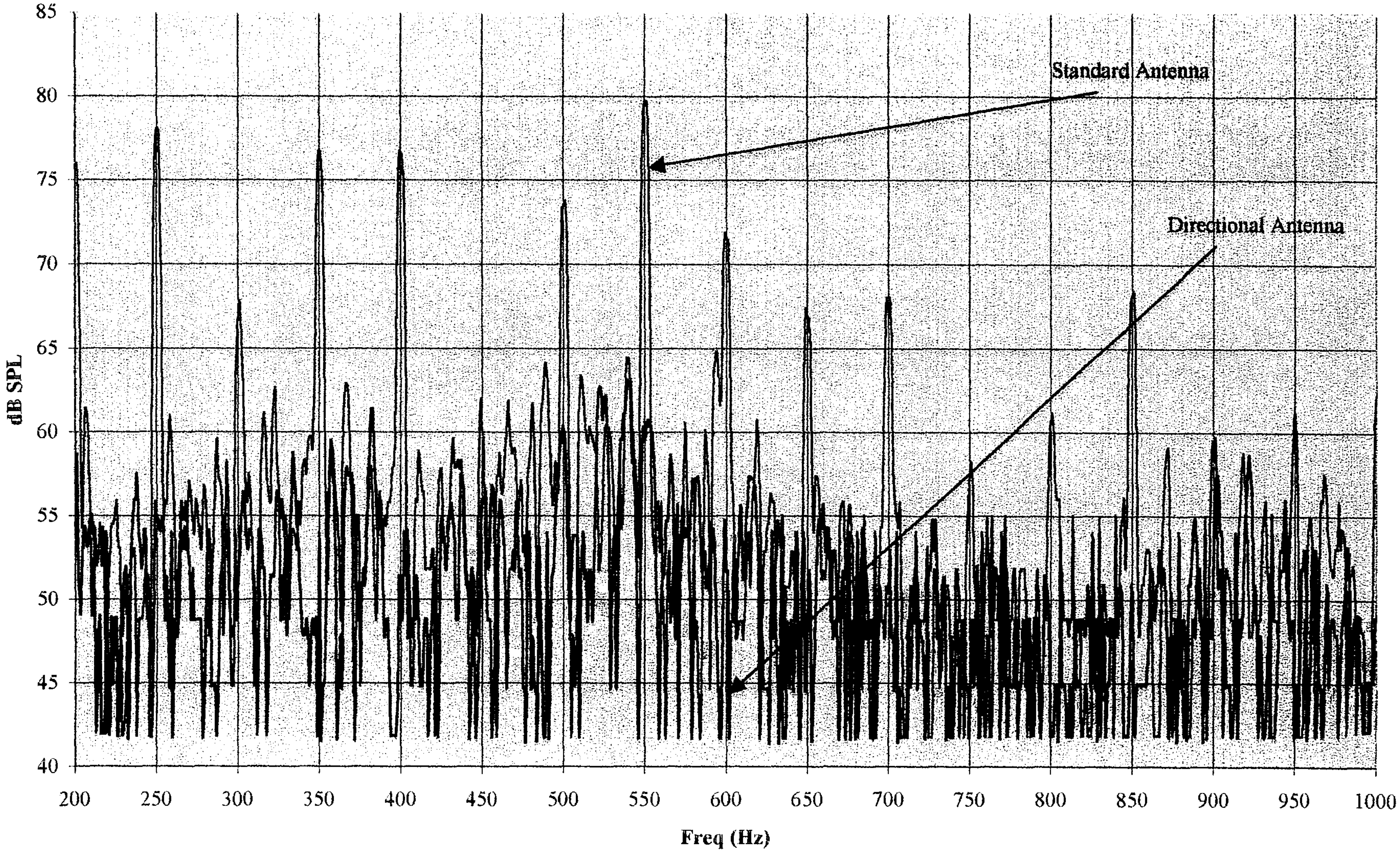
APPENDIX B

HEARING AID NOISE REDUCTION DATA



Comparison Directional vs Original Antenna Sequel Aid
Standard Antenna
With Directional Antenna
dB SPL
85
80
75
70
65
60
55
50
45
40
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
Freq (Hz)

Comparison Directional vs Original Antenna Axent ITE



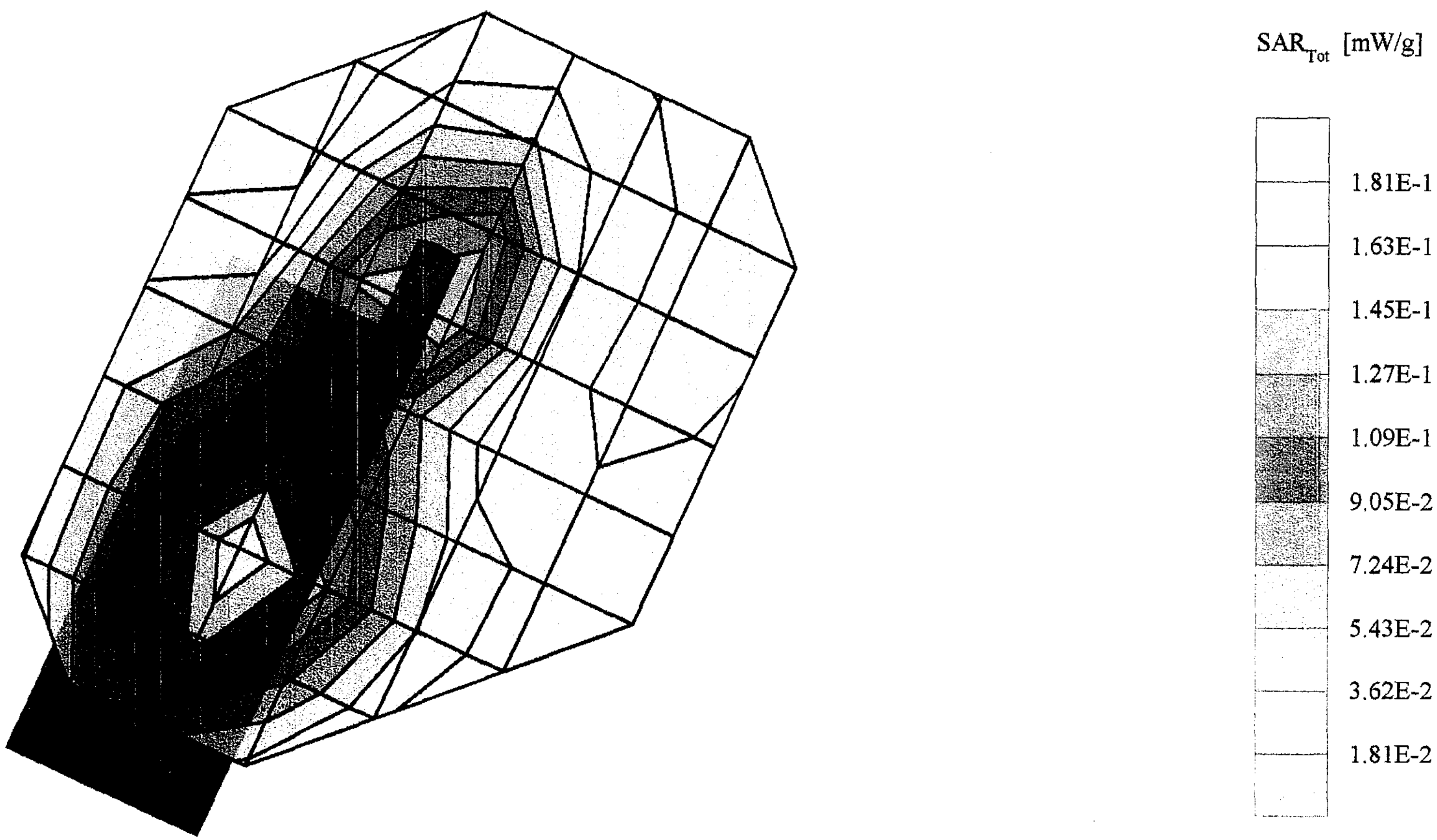
APPENDIX C

SAR DATA

04/05/02

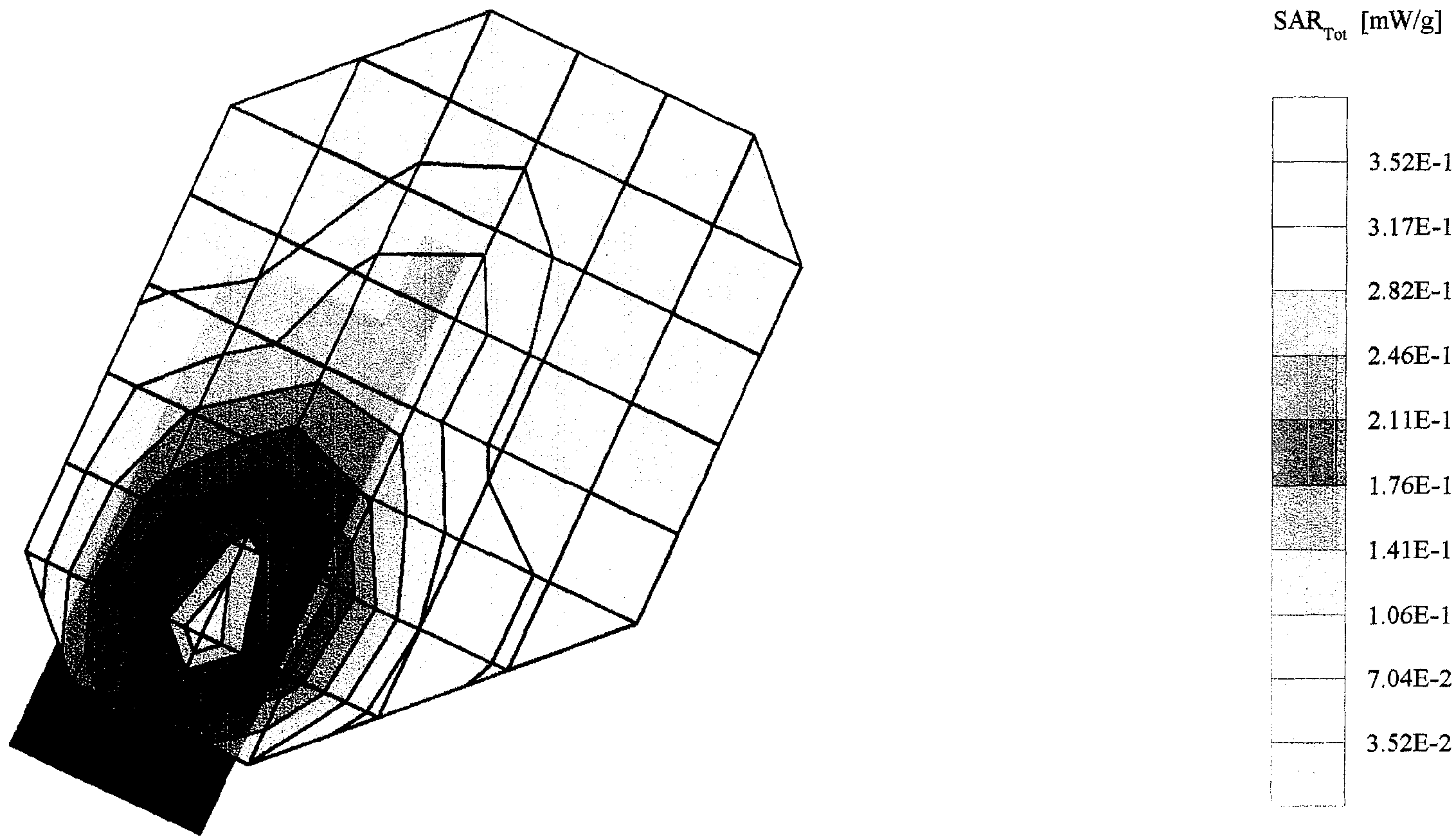
DAMAX Dualband Antenna on Nokia 5165

Generic Twin Phantom; Left Hand _X Section; Frequency: 835 MHz
Probe: ET3DV6 - SN1576; ConvF(7.00,7.00,7.00); Crest factor: 1.0; Brain 835 MHz: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.5$ $\rho = 1.00$ g/cm³
Cube 5x5x7: SAR (1g): 0.171 mW/g, SAR (10g): 0.125 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.57 dB; Power 500mWatts; Tilt



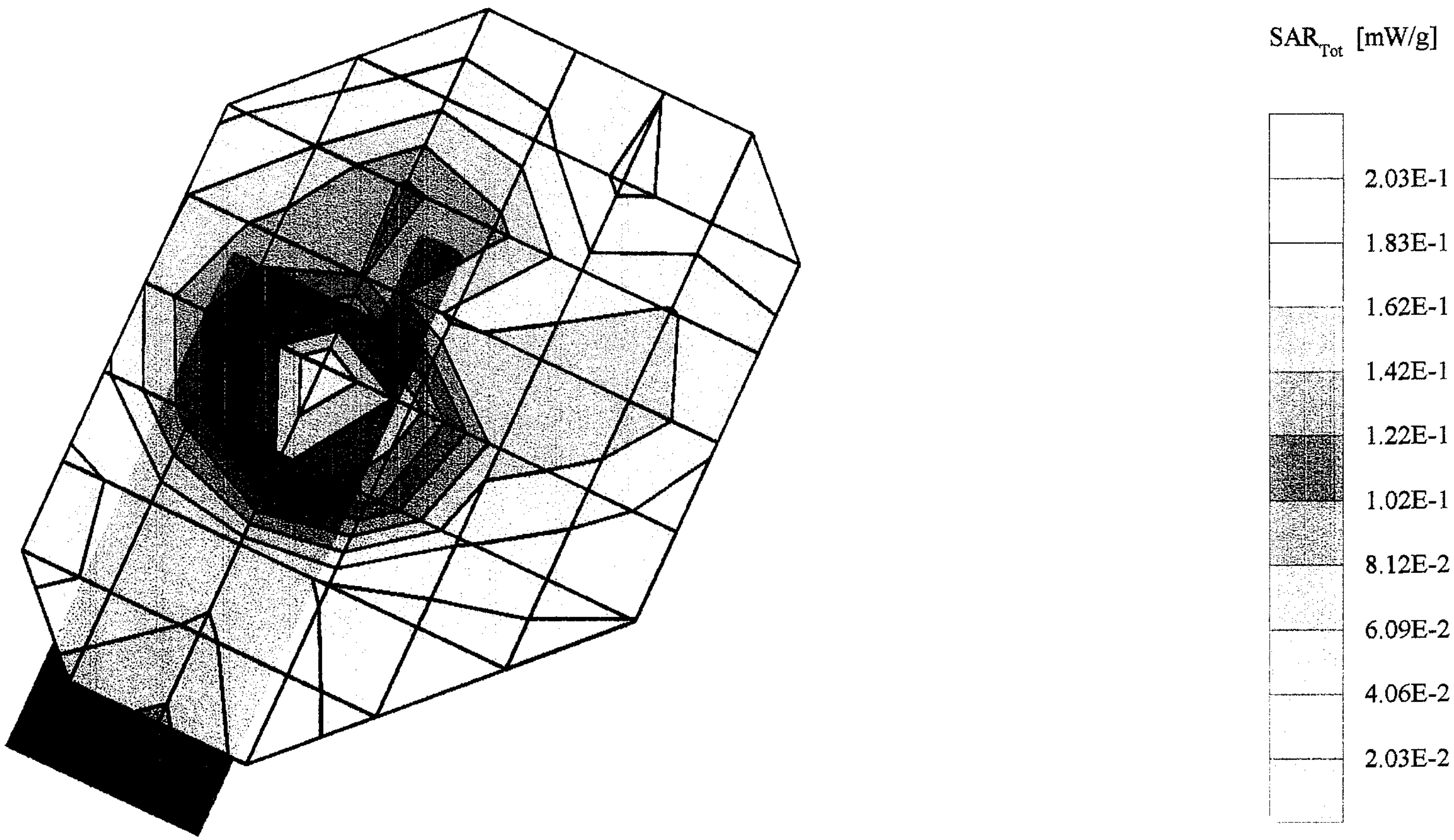
DAMAX Dualband Antenna on Nokia 5165

Generic Twin Phantom; Left Hand _X Section; Frequency: 835 MHz
Probe: ET3DV6 - SN1576; ConvF(7.00,7.00,7.00); Crest factor: 1.0; Brain 835 MHz: $\sigma = 0.90$ mho/m $\varepsilon_r = 41.5$ $\rho = 1.00$ g/cm³
Cube 5x5x7: SAR (1g): 0.358 mW/g, SAR (10g): 0.256 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.13 dB: Power 500mWatts; Cheek



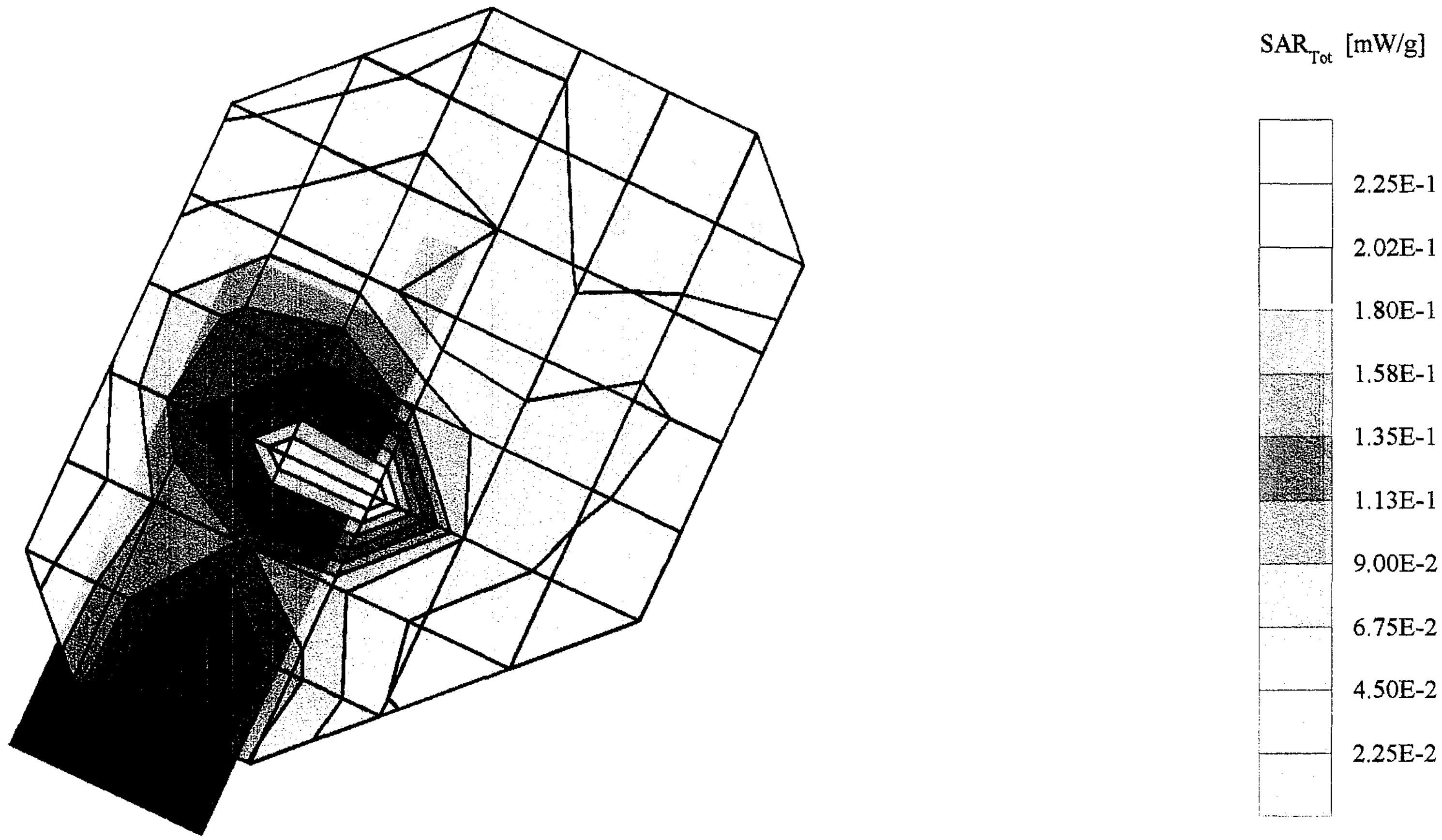
DAMAX Dualband Antenna on Nokia 5165

Generic Twin Phantom; Left Hand _X Section; Frequency: 1880 MHz
Probe: ET3DV6 - SN1576; ConvF(5.30,5.30,5.30); Crest factor: 1.0; Brain 1880 MHz: $\sigma = 1.44$ mho/m $\varepsilon_r = 41.4$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: SAR (1g): 0.224 mW/g, SAR (10g): 0.140 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.04 dB; Power 500mWatts; Tilt



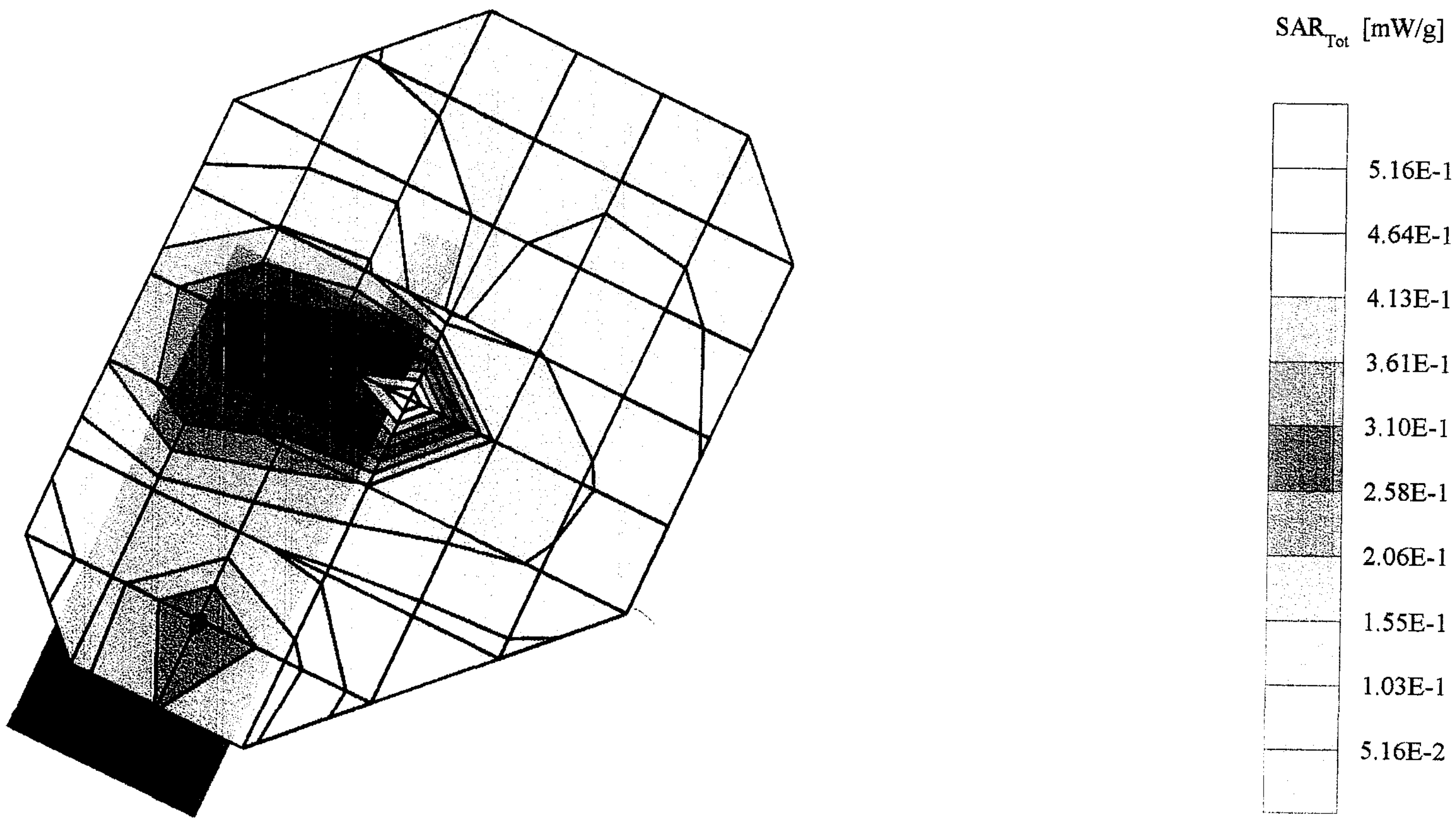
DAMAX Dualband Antenna on Nokia 5165

Generic Twin Phantom; Left Hand _X Section; Frequency: 1880 MHz
Probe: ET3DV6 - SN1576; ConvF(5.30,5.30,5.30); Crest factor: 1.0; Brain 1880 MHz: σ = 1.44 mho/m ε_r = 41.4 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.237 mW/g, SAR (10g): 0.149 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.07 dB; Power 500mWatts; Cheek



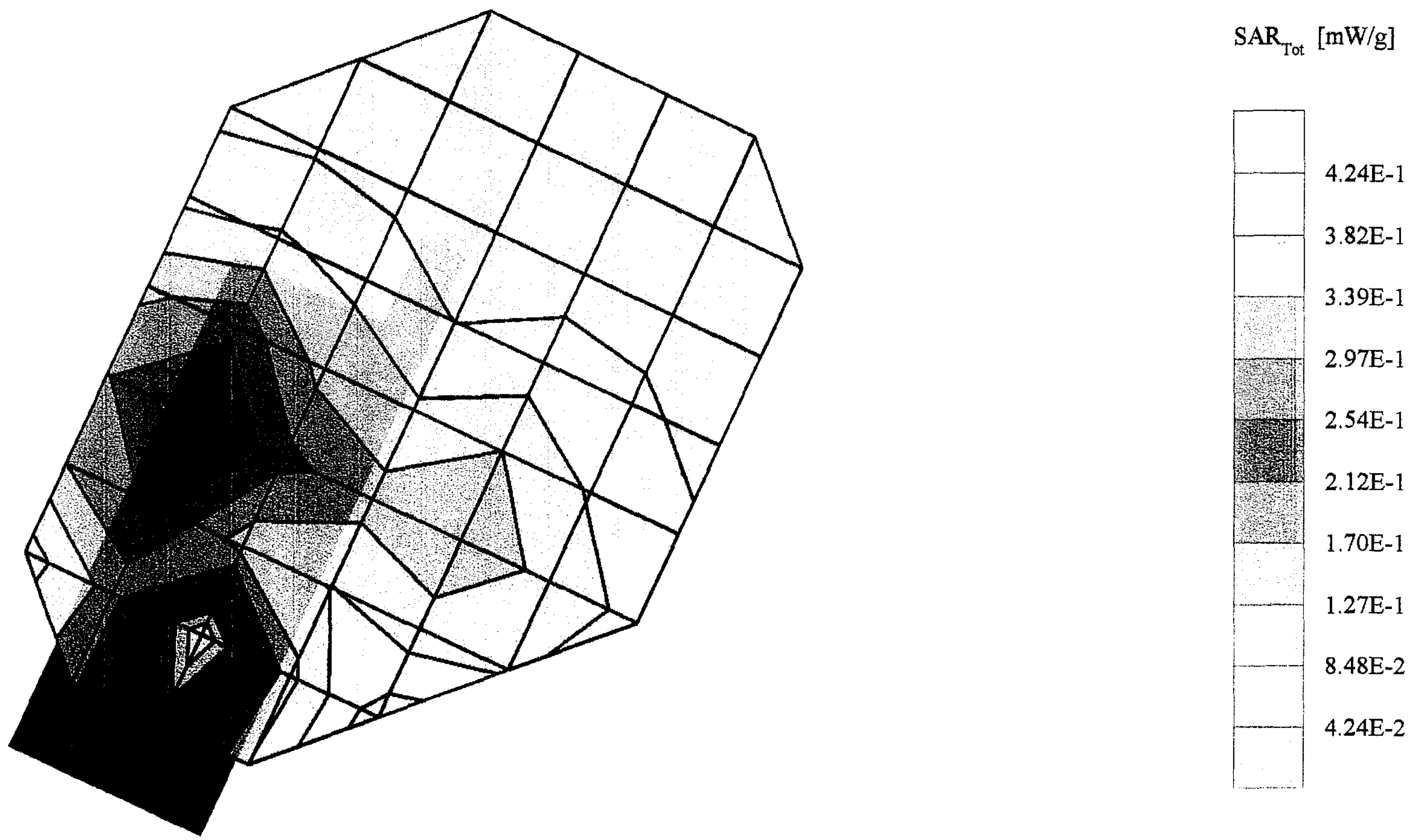
DAMAX PCS Antenna on Kyocera 2255

Generic Twin Phantom; Left Hand _X Section; Frequency: 1880 MHz
Probe: ET3DV6 - SN1576; ConvF(5.30,5.30,5.30); Crest factor: 1.0; Brain 1880 MHz: $\sigma = 1.44$ mho/m $\varepsilon_r = 41.4$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: SAR (1g): 0.501 mW/g, SAR (10g): 0.271 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.00 dB; Power 500mWatts. Tilt



DAMAX PCS Antenna on Kyocera 2255

Generic Twin Phantom; Left Hand _X Section; Frequency: 1880 MHz
Probe: ET3DV6 - SN1576; ConvF(5.30,5.30,5.30); Crest factor: 1.0; Brain 1880 MHz: $\sigma = 1.44$ mho/m $\epsilon_r = 41.4$ $\rho = 1.00$ g/cm^3
Cube 5x5x7: SAR (1g): 0.459 mW/g, SAR (10g): 0.265 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.31 dB; Power 500mWatts; Cheek



APPENDIX D

DAMAX FOUNDERS INFO

Greg Johnson is co-founder of DAMAX International, along with N.N. Luxon, a proven innovator in many fields, including education, entertainment, and wireless communications. Johnson is founder and president of Signal Antenna Systems, Inc (SAS) located in Watsonville, CA. SAS develops and manufactures specialized antenna products and systems for both military and commercial customers worldwide, and has been in business since 1983. DAMAX was formed to bring to market production quantities of new state-of-the-art antennas specifically designed for the wireless communications industry.

Johnson holds 10 issued and 11 pending patents for communications antennas, many of which are related to hand-held wireless devices. Prior to founding SAS to serve the military communications market, Johnson was president and founder (1977) of Signal Engineering, where he developed and manufactured a complete product line of antennas for the consumer electronics market. Signal Engineering was sold in 1983, and is currently in operation in Silicon Valley.

Prior to 1977, Johnson held various engineering positions with Silicon Valley firms including Teledyne MEC and Watkins-Johnson. While there, he designed and tooled for manufacture many innovative microwave products such as traveling wave tubes, YIG filters / harmonic generators, and highly specialized antennas and test systems, primarily for military systems applications.

Mr. Johnson has a BSEE from San Jose State University and MSEE from Stanford University. He holds the amateur extra class license K6ERT, and is a member of the APP Group of the IEEE.

N.N. (Bill) Luxon

Bill Luxon is the co-founder together with Greg Johnson, President of Signal Antenna Systems, of DAMAX International, an engineering and manufacturing corporation in wireless communication. Prior to DAMAX Luxon has taken two companies public and sold a third to an existing publicly held corporation. He is also the inventor and co-inventor of advanced technology devices which have been awarded five U.S. patents associated with products that were engineered, manufactured, and marketed by the companies he founded.

For more than three decades Luxon has introduced new products and services throughout North America. Among his accomplishments he founded the American Educational TV Network, the nation's first satellite television network devoted to continuing education programs for practicing professionals. At American Luxon obtained exclusive broadcast rights from national professional associations whose members were required to obtain credits to maintain their licenses to practice, and contracted with major cable TV companies nationwide to provide channels to transmit its programming.

In 1973, as founder of Communications Development Corporation, Mr. Luxon was responsible for licensing a new graphic animation system to more than 70 major network TV stations throughout the U.S. and Canada. His patented technology won the National Association of Educational Broadcasters Award for Animation in 1981, and earned him a grant from the National Endowment for the Arts to study its use in urban design. Among other "firsts," Mr. Luxon:

- Founded N. N. Luxon II Productions where, in association with the Univac division of Sperry Rand, he produced the first computerized game show in the history of TV; and
- Created and produced the first fully accredited real estate license course in the nation on video tape cassette in cooperation with the California Department of Real Estate.

In 1963 Mr. Luxon founded Vanguard General Services Corp., where he produced sales promotions for major league baseball, football, and hockey throughout the U.S. and in Canada. Under Luxon's direction Vanguard manufactured and sold more than 30 million sports related products nationwide.

In addition to his experience in manufacturing and marketing, Mr. Luxon has served as an advisor for adult continuing education for the California State University and Colleges, the largest system of higher education in the nation. He has also served as an executive recruiting consultant for Xerox, Santa Fe International, and Dean Witter, and directed the franchise of 28 executive search and placement offices throughout the U.S.

Prior to starting his own companies, Mr. Luxon worked as a copywriter and director of radio/TV for F.H. Hayhurst & Co., a major advertising agency in Canada, and as division manager for Sears, Roebuck and Company, where he recruited and trained numerous commission sales and management personnel for the Sears Educational Sales Division in the southeastern U.S.

Mr. Luxon is an alumnus of Columbia College (Columbia University) in New York City. He is a licensed pilot with more than 3,000 hours pilot-in-command, an active tennis player, hiker and skier, and is married to his bride (of more than 40 years), and has three grown children.